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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,443	09/04/2001	Michiel Jacques van Nieuwstadt	200-1758 JDR	9487

22844 7590 01/28/2003

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EXAMINER	
NGUYEN, TU MINH	
ART UNIT	PAPER NUMBER
3748	

DATE MAILED: 01/28/2003

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 11

Application Number: 09/682,443
Filing Date: September 4, 2001
Appellant(s): Michiel Jacques van Nieuwstadt

MAILED
JAN 2 8 2003
GROUP 3700

Richard M. Sharkansky
For Appellant

EXAMINER'S ANSWER

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This is in response to appellant's brief on appeal filed on November 18, 2002.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct..

(7) Grouping of Claims

The rejection of claims 1 and 4-11 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

6,167,698	King et al.	1-2001
5,201,802	Hirota et al.	4-1993

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by King et al. (U.S. Patent 6,167,698).

King et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx, comprising injecting the hydrocarbon into the engine exhaust in accordance with detection of a light-off event (lines 19-30 of column 3).

2. Claims 4-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirota et al. (U.S. Patent 5,201,802).

Re claims 4-6 and 10, as illustrated in Figures 6 and 14-18, Hirota et al. disclose a method for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, comprising:

(a) detecting a temperature difference (Δt) indicating an exothermic reaction across the catalyst (step 608);

(b) comparing the temperature difference with a predetermined temperature threshold (ΔTi) (step 610);

(c) determining an exothermic condition temperature (T2) at an output of the catalyst when the temperature difference is determined to exceed the threshold (step 614, Figure 17);

(d) comparing the determined exothermic condition temperature with an exothermic condition temperature (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition temperature; and

(e) modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and

550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 7 and 9, as shown in Figures 6 and 14-18, Hirota et al. disclose a system and a processor (10) for controlling hydrocarbon injection into an engine exhaust to reduce NOx in such exhaust, such engine exhaust with the NOx and the injected hydrocarbon being directed to a catalyst (6) for reaction therein, the system comprising:

(a) a catalyst (6) for facilitating a reaction between the injected hydrocarbon and NOx in the exhaust;

(b) a hydrocarbon injector (14) for injecting the hydrocarbon into the exhaust upstream of the catalyst;

(c) a detecting system comprising:

- a pair of sensors (24, 20) each detecting a common parameter in the exhaust, one of such sensors being upstream of the catalyst and the other one of the sensors being downstream of the first sensor; and

- a processor (10) for controlling the hydrocarbon injector in response to the pair of sensors, such processor being programmed to:

- comparing a difference (Δt) in the common parameter detected by the pair of sensors with a predetermined temperature threshold (ΔTi) (step 610);

- determining an exothermic condition (T2) at an output of the catalyst when the difference in the common parameter is determined to exceed the threshold (step 614, Figure 17);

- comparing the determined exothermic condition with an exothermic condition (550 in Figure 17) expected from the catalyst at a time prior to the determined exothermic condition; and

- modifying the injected hydrocarbon in accordance with the last-mentioned comparison (steps 618 and 620; also see Figure 18 and line 10 of column 9 to line 3 of column 10) (Hirota et al. determine in advance a desired lower limit catalyst inlet temperature T1 and a desired upper limit catalyst outlet temperature T2 for the optimum reduction of NOx as a function of the degradation extent DR (Figure 17). For a non-deteriorated catalyst, T1 and T2 equal 450 and 550, respectively. If a detected temperature difference (Δt) across the catalyst is different from a predetermined temperature threshold (ΔTi), a degradation extent DR is calculated (step 612); and a set of desired temperature values T1 and T2 are determined based on the calculated DR (step 614). A hydrocarbon concentration H1 is also determined based on DR).

Re claims 8 and 11, in the system and method of Hirota et al., the common parameter is temperature and wherein the sensors are temperature sensors.

(11) Response to Argument

BRIEF BACKGROUND OF KING ET AL.:

As shown in Figures 1 and 2, King et al. disclose a system for the controlled introduction of hydrocarbons as a reducing agent into a nitrogen oxide-containing exhaust gas leaving an internal combustion engine through an exhaust line having a catalytic converter (40) for reducing nitrogen oxides (NOx) in the exhaust gas by applying the Selective Catalytic Reduction (SCR) process. In this process, hydrocarbons are controllably introduced into a NOx-containing exhaust gas at an upstream location from a catalytic converter. If the catalytic converter is in an operating mode, the injected hydrocarbons are readily reacted with the NOx in the exhaust gas at the catalytic converter to form the harmless products of nitrogen gas and water. Similar to the pending application, the system of King et al. further includes a hydrocarbon injector (42) at a location upstream from the catalytic converter, an upstream temperature sensor (50) and a downstream temperature sensor (52) to detect exhaust gas temperatures at a location upstream and downstream, respectively, of the catalytic converter, and a controller (18) that receives the signals from the temperature sensors to determine whether or not hydrocarbons should be injected into the exhaust gas (lines 22-25 of column 3). King et al. further disclose that hydrocarbons are not injected when the catalytic converter is outside its prime operating mode (lines 25-30 of column 3). In other words, King et al. only inject hydrocarbons when the catalytic converter is inside its prime operating mode.

BRIEF BACKGROUND OF HIROTA ET AL.:

As shown in Figure 6, Hirota et al. also disclose a system for the controlled introduction of hydrocarbons as a reducing agent into a nitrogen oxide-containing exhaust gas leaving an internal combustion engine through an exhaust line having a catalytic converter (6) for reducing nitrogen oxides (NOx) in the exhaust gas through the SCR process. Similar to the systems in King et al. and in the pending application, the system of Hirota et al. further includes a hydrocarbon injector (16) at a location upstream from the catalytic converter, an upstream temperature sensor (24) and a downstream temperature sensor (20) to detect exhaust gas temperatures at a location upstream and downstream, respectively, of the catalytic converter, and a controller (10) to determine an amount of injected hydrocarbons based on the detected exhaust gas temperatures. Similar to Figure 3 in the pending application, Hirota et al. display Figure 7 to show that a prime or optimum operating window (between T1 and T2) to purify NOx depends on the age or a deteriorated level of the catalytic converter. The prime operating window and its optimum operating temperature (a, b, or c) are shifted to the right (higher temperature) with higher deteriorated level in order to optimize a NOx purification efficiency. Similar to the pending application, Hirota et al. also determine the deteriorated level based on only the signals from the aforementioned two temperature sensors; and adjust a quantity of injected hydrocarbons based on the determined deteriorated level in order to maintain a high degree of NOx purification by the catalytic converter (see Figures 14-18).

<u>ISSUE (A)</u>: With regard to the 35 U.S.C. 102 rejection of claim 1, King et al. fail to anticipate all of the elements of the claimed invention.

Regarding the base claim 1, in response to appellant's argument that King et al. fail to disclose injecting the hydrocarbons into the engine exhaust in accordance with detection of a light-off event (page 10 of Appellant's Appeal Brief), the examiner respectfully disagrees.

As discussed in the brief background of King et al., they only inject hydrocarbons when the catalytic converter is inside its prime operating mode (lines 25-30 of column 3). Only in this prime operating mode, the injected hydrocarbons can be made to react with the NOx in the exhaust gas in a sufficient scale such that no excess hydrocarbons are inadvertently released to the atmosphere. Also in this mode, the hydrocarbons are also oxidized to release large quantity of heat to raise an exhaust gas temperature. This is why the downstream temperature sensor can detect a higher temperature at the outlet of the catalytic converter than that at the inlet when the catalytic converter is inside its prime operating mode. The examiner hereby argues that the light-off event in a catalytic converter that appellant is referring to is the <u>onset event</u> of the prime operating mode in King et al. (emphasis added). In this context, the prime operating mode in King et al. can be seen as a number of events of which each displays a different NOx purification efficiency. The very first event or the onset event in this operating mode displays a threshold NOx purification efficiency that is sufficient for hydrocarbons to be injected to assist in the purification of the exhaust gas. The examiner again urges that this very first event in King et al. is indeed the light-off event as claimed in claim 1 of the pending application. Claims in a pending

application are given their broadest reasonable interpretation. See *In re Pearson*, 181 USPQ 641 (CCPA 1974). Thus, in the broadest reasonable interpretation of claim 1, King et al. clearly disclose the injection of hydrocarbons into the engine exhaust in accordance with detection of a light-off event.

ISSUE (B): With regard to the 35 U.S.C. 102 rejection of claims 4-11, Hirota et al. fail to anticipate all of the elements of the claimed invention.

Regarding the claims 4-11, in response to appellant's argument that Hirota et al. only determine a temperature range (lower temperature limit T1 and upper temperature limit T2) and thus fail to disclose the determination an exothermic condition temperature at an output of the catalyst when the temperature difference is determined to exceed the threshold (page 15 of Appellant's Appeal Brief), the examiner again respectfully disagrees.

As clearly shown in Figure 14, Hirota et al. detect a temperature difference (Δt) indicating an exothermic reaction across the catalyst (step 608), comparing the temperature difference with a predetermined temperature threshold (ΔTi) (step 610), and determining an exothermic condition temperature (T2) at an output of the catalyst when the temperature difference is determined to exceed the threshold (zero) (step 614, Figure 17) (emphasis added). In Hirota et al., the threshold is zero so that any deviation between Δt and ΔTi would result in a calculation of a desired or an object exothermic condition temperature (T2) at an output of the catalyst (see step 614 and Figure 17) and a calculation of a new hydrocarbon injection quantity (see step 618 and Figure 18)

so that the catalytic converter can be maintained at an optimum operating window defined by T1 and T2 shown in Figure 7.

The lower temperature limit T1 and upper temperature limit T2 determined in step 614 can be broadly interpreted as the determined exothermic condition temperatures claimed in the pending application. This must be so because as shown in Figures 7 and 17, T2 is always higher than T1; and since exothermic reaction is the only major source of heat generation within the catalytic converter, these limits can be reasonably defined by the examiner as exothermic condition temperatures. Claims in a pending application are given their broadest reasonable interpretation. See *In re Pearson*, 181 USPQ 641 (CCPA 1974). Thus, in the broadest reasonable interpretation of claims 4-11, Hirota et al. clearly disclose the determination of an exothermic condition temperature at an output of the catalyst when the temperature difference is determined to exceed the threshold.

In response to appellant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which appellant relies (i.e., exothermic condition temperature is a light-off temperature determined at the inlet of the catalytic converter) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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January 27, 2003

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